Seasonal Assessment Of Physico-Chemical And Biological Properties of Water In Nawalgarh Tehsil of Jhunjhunu District And Removal Of Fluoride Through Low Cost Bio-adsorbant

A Synopsis Submitted

In

Partial Fulfillment For The Award Of The Degree

Of

Doctor Of Phillosophy In Zoology

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2023

Introduction :

Without water, life would not function properly on Earth. It is the reason why the planet is he only place on Earth where life exists. Water is a vital resources that we have on this planet. Without it, life would not be able to function properly. About 70% of earth's surface is covered with water. On the other hand, around 96.5% of the planet's water is in the ocean. some of the water is found in rivers, lakes, icecaps, glaciers and in the ground as soil moisture and in the aquafires. In addition, fluoride, which is a negative ion of fluorine, is widely found in nature. It occurs naturally in air, soil, plants, rocks, freshwater, seawater, and many foods. Fluoride also plays a role in the mineralization of bones and teeth, a process that is essential for keeping bones and teeth hard and strong. In fact, about 99% of the body's fluoride is stored in bones and teeth. Fluorides are used industrially in the manufacture of fluorinated compounds, ceramics, pesticides, aerosol propellants, refrigerants, glassware, and Teflon cookware. It is generally an undesirable byproduct of aluminum, fertilizer, and iron ore production. Fluorides are the most commonly found chemical elements in groundwater, making them one of the top toxicological environmental hazards worldwide. Fluoride occurrence in groundwater is due to weathering and leaching of fluoride-bearing minerals from rocks and sediments. Fluoride reduces tooth decay and promotes dental health at low doses (mg/L), but high concentrations (>1.5 mg/L) can cause fluorosis. It is estimated that around 200 million people from 25 countries around the world may suffer from fluorosis, attributed to fluoride contamination of groundwater, including India.High levels of fluoride in groundwater is expected from calcium-deficient sodium bicarbonate water.The alkalinity of the water also helps to transfer fluoride from fluorite (CaF2). Human fluoride exposure is related to (1) fluoride concentration in drinking water, (2) duration of consumption, and (3) local climate. In hot climates with high water consumption, fluoride exposure should be adjusted based on average fluoride intake. Various methods of cheap and easy water defluoridation technology are already known, but the benefits of such technology are not reaching affected rural populations due to limitations. The amount of fluoride accumulated in soils worldwide is estimated at 85 million tons, with approximately 12 million tons in India. The main sources of fluoride were drinking water and foods such as sea fish, cheese, and tea. Fluoride is present in all bodies of water and occurs in particularly high concentrations in groundwater. The fluorine nucleus exists as a single isotopic species with an atomic mass of 19 and has an atomic mass number of 19.00452 and a nuclear spin of 12. The electron affinity of a fluorine atom EA(F) is the energy released when the atom itself adds an electron. Fluorine has the highest affinity and highest ionization potential among the halogens. The occurrence of high levels of fluoride in groundwater is primarily due to weathering of fluoride-bearing minerals, as well as volcanic and fumarolic processes. Common fluoride minerals found in the Earth's crust are fluorite (CaF2), cryolite (Na3AIF6), and fluoroapatite (Ca10F2(PO4)6). Their dissolution leads to excess fluoride in groundwater, which is produced by various industries such as pesticides, disinfectants, wood preservatives, metal, glass, steel and aluminum manufacturing, television tube manufacturing and the phosphate fertilizer industry. This is not the reason for the unusually high concentrations of F in groundwater in all 33 districts of Rajasthan. artificial reason. Higher due to natural causes Abundant F-bearing minerals in the host rock and Sediment 15. Main rocks are granite, gneiss, mica, slate, limestone, sandstone, phosphate, slate, Clays, acidic igneous rocks, basalts, alluvial rocks, etc., and these Contains fluorine-bearing minerals that make up

the F range 180-3100 ppm (average). like their chemical behavior Degradation, Dissociation, Dissolution and Interaction Considered the main cause of F with water Groundwater17. The distribution of F is also related to local hydrogeological and climatic conditions. Next Hydrogeological structure, climate, geomorphology Other important factors15,17. Areas with low rainfall water bodies with high F content compared to groundwater Areas of high precipitation despite similar hydrogeological formations15,17 For example, groundwater in districts such as Chittorgarh, Udaipur and Banswara receives more precipitation. Compared to Ajmer and Birwala districts, the F content is low 17. Geographically, it turns out to be a hilly area have water with a low F content compared to flat place. Dilution with a quick salt rinse Hilly areas with high precipitation have lower F content Sea area 17 in these regions. weathering and leaching processes primarily due to water movement and osmosis Plays an important role in increasing or decreasing F concentration in groundwater. Other factors such as chemicals composition, presence and availability of F minerals Contact time of water and mineral springs and water also determine the emission of F in water15,17. According to WHO. In the 1984 and Indian Standard Drinking Water Specifications, the maximum permissible limit for fluoride in drinking water is 1.5 ppm, with a preferred upper limit of 1.0 ppm. Therefore, removing fluoride from water is very necessary to solve many health problems.Many chemical and biological substances are used as adsorbents for fluoride removal. Bioadsorbents are inexpensive, readily available, and effective in removing fluoride.

Objectives :

- **To determine physico chemical and biological properties of water.**
- **To determine the efficacy of Bio-adsorbants for fluoride removal from water.**
- **To compare the effectiveness of different bio adsorbants for fluoride absorption.**
- **To determine the combine effect of bio adsorbants for fluoride removal.**
- **To determine property of water seasonally.**

Review of literature :

P Senthil et al. Treatment of Fluoridated Water (2019) Ultimately, excess fluoride in drinking water poses health risks to communities. Researchers therefore recommended that fluoride in drinking water is unsafe.As a result, defluoridation was tested using different types of sorbents. Dr. Sunita and Dr. Archana (2014) reported that by natural adsorbents such as coconut shell charcoal, activated charcoal (Muthukumaran et al., 1995, Sivabalan et al. 2002), bone char (Killedar and Bhargava 1993) and ions concluded the removal of fluoride from drinking water. Exchange resins (Shrivastava and Deshmukh 1994) were used as adsorbents. Activated carbon made from various sources has excellent ability to remove fluorine from drinking water. These biosorbents can be successfully used to remove fluoride over a wide range of concentrations. The treated biosorbents have been observed to be effective in uptake of fluoride ions between pH 2.0 and 10.0. Fluoride removal for a given biosorbent size increased with time and reached equilibrium within 1.5 hours. The percentage of fluoride removal at a given initial solute concentration has been found to be a function of sorbent dosage and time. It increased with time and sorbent dosage. The process of treated biosorbents follows the Langmuir isotherm. The adsorption capacities of the treated biosorbents were investigated at varying initial concentrations of fluoride ions between 2 and 15 mg/l and a maximum particle size of 1.4 mm. The amount of adsorbed fluoride ions was 95% with a minimum particle size of 600 µ at an initial fluoride ion concentration of 10 mg/l. It was observed that 90 adsorption yielded such results because the smaller the particle size, the larger the active surface area. The treated biosorbent can be safely disposed of by incineration after use. Pavitra Anadurai et al. (2019) concluded that the fluorine status of the Red Deer Chatham block in Dindigur district, Tamil Nadu, is fluorine-specific. More than 32% of the blocks are severely affected by fluoride concentrations up to 1.5 mg l-1 and many suffer from dental fluorosis. Rock weathering and leaching of fluoride-bearing minerals are the main factors contributing to increased fluoride concentrations in groundwater. Assessment of groundwater quality and mapping of fluoride endemic areas using WQI (Water Quality Index) technology. Pravin (2002) concluded that it is possible to remove fluoride from water to the required concentration by adsorption. Herringbone charcoal is probably the most suitable sorbent for fluoride removal compared to charcoal, fly ash, granular brick and animal charcoal. Fluoride adsorption is pH dependent and decreases as the pH of the solution increases. Kuldeep Krishan et al. Bishnah (J&K) evaluated fluoride in surface and surface water bodies and seasonal variation with physicochemical parameters. (1 mg/l, WHO, 1984). Therefore, drastic defluoridation methods are not necessary in the current research area. Minor dietary changes (such as high calcium diets) and special attention to the use of pesticides and fertilizers are recommended. This will help reduce the impact of fluorosis in the study area. Tesfaye et al. concluded the removal of fluoride from drinking water by sorption using diatomaceous earth modified with aluminum hydroxide. Diatomaceous earth modified by treatment with aluminum hydroxide has been shown to be an effective adsorbent for the defluoridation of aqueous solutions and natural groundwaters. Maximum fluoride removal rate and adsorption capacity for 10 mg/L fluoridated water under optimal adsorption conditions (contact time: 180 min, adsorbent dosage: 25 g/L, pH 6.7, room temperature) were 89% and 1.67 mg/g, respectively. temperature and shaking speed: 150

rpm). The adsorption data were well fitted to Freundlich adsorption isotherms with good correlation coefficients indicating multi-layered sorption on heterogeneous adsorbent surfaces. Sorption kinetics were studied using pseudo first-order and pseudo second-order kinetic models. The data fit better to pseudo-second-order kinetics indicating that the adsorption is due to chemisorption. Since intraparticle diffusion was not the rate-limiting mechanism, the rate-limiting step in adsorption is most likely a process involving ion exchange or the attraction of F to the adsorbent surface. The results of this study demonstrate that this low-cost sorbent DE can be used to remove fluoride from groundwater and other water samples containing excessive levels of fluoride potentially harmful to human health. showed. This sorbent is cheap, plentiful, and readily available P Senthil Kumar et al. Treatment of Fluoridated Water (2019) Ultimately, excess fluoride in drinking water poses health risks to communities. Researchers therefore recommended that fluoride in drinking water is unsafe.As a result, defluoridation was tested using different types of sorbents. Dr. Sunita and Dr. Archana (2014) reported that by natural adsorbents such as coconut shell charcoal, activated charcoal (Muthukumaran et al., 1995, Sivabalan et al. 2002), bone char (Killedar and Bhargava 1993) and ions concluded the removal of fluoride from drinking water. Exchange resins (Shrivastava and Deshmukh 1994) were used as adsorbents. Activated carbon made from various sources has excellent ability to remove fluorine from drinking water. These bio sorbents can be successfully used to remove fluoride over a wide range of concentrations. The treated bio sorbents have been observed to be effective in uptake of fluoride ions between pH 2.0 and 10.0. Fluoride removal for a given biosorbent size increased with time and reached equilibrium within 1.5 hours. The percentage of fluoride removal at a given initial solute concentration has been found to be a function of sorbent dosage and time. It increased with time and sorbent dosage. The process of treated biosorbents follows the Langmuir isotherm. The adsorption capacities of the treated biosorbents were investigated at varying initial concentrations of fluoride ions between 2 and 15 mg/l and a maximum particle size of 1.4 mm. The amount of adsorbed fluoride ions was 95% with a minimum particle size of 600 µ at an initial fluoride ion concentration of 10 mg/l. It was observed that 90 adsorption yielded such results because the smaller the particle size, the larger the active surface area. The treated biosorbent can be safely disposed of by incineration after use. Pavitra Anadurai et al. (2019) concluded that the fluorine status of the Red Deer Chatham block in Dindigur district, Tamil Nadu, is fluorine-specific. More than 32% of the blocks are severely affected by fluoride concentrations up to 1.5 mg l-1 and many suffer from dental fluorosis. Rock weathering and leaching of fluoride-bearing minerals are the main factors contributing to increased fluoride concentrations in groundwater. Assessment of groundwater quality and mapping of fluoride endemic areas using WQI (Water Quality Index) technology. Pravin (2002) concluded that it is possible to remove fluoride from water to the required concentration by adsorption. Herringbone charcoal is probably the most suitable sorbent for fluoride removal compared to charcoal, fly ash, granular brick and animal charcoal. Fluoride adsorption is pH dependent and decreases as the pH of the solution increases. Kuldeep Krishan et al. Bishnah (J&K) evaluated fluoride in surface and surface water bodies and seasonal variation with physicochemical parameters. (1 mg/l, WHO, 1984). Therefore, drastic defluoridation methods are not necessary in the current research area. Minor dietary changes (such as high calcium diets) and special attention to the use of pesticides and fertilizers are recommended. This will help reduce the impact of fluorosis in the study area. Tesfaye et al. concluded the removal of fluoride from drinking water by sorption using diatomaceous earth modified with aluminum

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METHODOLOGY :

- **Collection of samples – The water sample will be collected from some areas of Nawalgarh tehsil in various seasons like – spring, summer, rainy and winter. For analysis of physical, chemical and biological properties of water various experimental method will be used.**
- **Investigation of physico-chemical and biological parameters.**
- **pH – by pH meter**
- **Temprature – by centigrade thermometer**
- **Electric conductivity – by digital conductivity meter**
- **Total alkanity – by titration method**
- **Hardness – by EDTA titration method**
- **Total dissolved solid – by evaporation of filtered sample**
- **Biological oxygen demand – by 5 day incubation at 20 C with serial dilution**
- **Chemical oxygen demand – by potassium dichromate method**
- **Fluoride ion concentration – by fluoridometer**
- **Dissolved oxygen – by wrinkler method**
- **Total colliforms – by membrane filter technique**
- **E.coli and Salmonella – by plate culture method**
- **Removal of fluoride – The removal of fluoride from drinking water will be carried out using adsorption method using different low-cost bio-adsorbent such as – wheat husk, groundnut husk, neem leaves, peepal leaves etc.**
- **Chemical precipitation.**
- **Ion exchange**
- **Adsorption**
- **Miscellaneous methods including RO, electro-dialysis, etc.**

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